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ABSTRACT

This summary offers highlights of a conference hosted by the Southern Regional Educational Board-State Vocational Education Consortium, a 6-year effort to develop, apply, evaluate, and promote strategies to strengthen the basic competencies of high school students enrolled in vocational education programs. An introduction provides summaries of presentations on the conference goals of sharing information and ideas and combining vocational and academic studies; instructional principles for increased learning; conditions forcing change in the educational system; changing school experiences to improve achievement in the basic competencies; leadership as the key to success; and the need for a better-educated work force. Chapter 1 summarizes participants' comments on the first step toward improving the preparation of vocational students for employment and continued learning on the job or at a postsecondary institution--raising expectations for students pursuing vocational studies. Chapter 2 focuses on participant remarks concerning the consortium goal of increasing the percentage of vocational students who complete higher-level academic courses. Chapter 3 focuses on workshop presentations that address emphasis on increased academic content in vocational courses and applied learning activities in academic courses. Chapters 4, 5, and 6 summarize participants' comments on pilot site programs that: advance basic competencies through career guidance and remedial studies; provide staff development for vocational and nonvocational teachers; and participate in an evaluation and assessment plan. A final section is a summary of the conference. (YLB)

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Linking Vocational and Academic Education

SREB-State Vocational Education Consortium

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IMPROVING THE COMMUNICATIONS, MATHEMATICS, AND SCIENCE COMPETENCIES OF STUDENTS ENROLLED IN VOCATIONAL COURSES

A Report on the Second Annual Staff Development Conference of the SREB-State Vocational Education Consortium

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Foreword

Vocational education programs that place a high priority on developing basic academic skills can help produce high school graduates with the necessary skills for further learning—on the job or in formal education. There are too few of these programs today.

Goals for Education
CHALLENGE 2000

Southern Regional Education Board, 1988

In 1987, under the direction of the Southern Regional Education Board (SREB), 13 states and The National Center for Research in Vocational Education at The Ohio State University formed the SREB-State Vocational Education Consortium, a six-year effort to develop, apply, evaluate, and promote strategies to strengthen the basic competencies—communications, mathematics, science, critical thinking, and problem-solving—of high school students enrolled in vocational education programs. After an initial year of overall planning, over 30 pilot sites in 13 states are now developing or implementing specific programs to meet the goals of the Consortium. Recently, Louisiana became the 14th state in the Consortium; pilot sites are currently being identified for the 1989-1990 school year.

In August of 1988, the Consortium hosted its Second Annual Staff Development Conference to bring together over 350 academic and vocational teachers, counselors, principals, and state and local school personnel from the 13 participating states. The Conference afforded participants the opportunity to share their successes and difficulties as they devise ways to advance the basic skills of vocational students. A wide variety of presentations were made throughout the conference to offer new ideas for school personnel to consider.

This summary of the Second Annual Staff Development Conference is intended to assist educators at the state and local levels as they develop and implement new activities to improve the high school experiences of vocational students. As technological advances continue to change the demands of the workplace, students whose education is limited to training in one specific skill will not succeed in most work settings. Employees must be able to continue to learn and adapt to new technologies. The programs and ideas presented in this summary are directed to helping schools provide students with the basic competencies and technical knowledge necessary to succeed in today's and tomorrow's ever-changing society.

Winfred L. Godwin, President
Southern Regional Education Board

THE SREB-STATE VOCATIONAL EDUCATION CONSORTIUM

Dedicated to Strengthening the Basic Competencies of Students Enrolled in Vocational Education Programs

Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, and West Virginia

in collaboration with
Southern Regional Education Board
and
The National Center for Research in Vocational Education

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Introduction

Conference Goal: Sharing Information and Ideas

Former Governor Robert W. Scott of North Carolina maintains that efforts to improve education in the South can substantially improve the prospects of non-college bound students at a time when their futures are particularly threatened.

The goals of the Southern Regional Education Board (SREB)-State Vocational Education Consortium, according to Governor Scott, are on the leading edge, with important consequences not only for vocational students, but also for all who think about schooling at the end of the 20th century.

Governor Scott's remarks were made in August of 1988 during the Consortium's Second Annual Staff Development Conference. The 350 participants represented over 30 Consortium pilot sites in 13 SREB states and included teachers of English, mathematics, science, and vocational subjects, along with principals, counselors, superintendents, and school board members. Observers from Washington, D.C., Minnesota, and Illinois also attended.

The purpose of the Conference was to share information and ideas about ways to raise the communications, mathematics, and science competency levels of students who complete a secondary vocational curriculum designed to prepare them for continued learning in a changing work environment.

Consortium Goal: Combining Vocational and Academic Studies

Governor Scott, now State President of the North Carolina Board of Community Colleges and a member of the SREB Commission for Educational Quality, reemphasized the Consortium's suggestions for 10 practices to increase the basic competencies of vocational completers:

1. Establish higher basic competency expectations for vocational completers.
2. Increase the percentage of vocational completers who take higher-level communications, mathematics, and science courses.
3. Increase the amount of emphasis and instructional time in vocational courses devoted to teaching and reinforcing the basic competencies that underlie the occupational field of study.
4. Increase the amount of emphasis and instructional time devoted to applied learning activities in basic competency courses.

5. Develop teams of vocational and non-vocational teachers who work together to encourage and provide a broad range of instruction in communications, mathematics, and science and offer personal support services to students enrolled in vocational courses.
6. Establish specific requirements for vocational completers, including the number of units in each vocational field of study; related vocational courses, including keyboarding and computer literacy competencies; and specific mathematics and science courses related to each vocational field of study.
7. Provide four-year Individualized Academic Education Plans, remedial studies, and coordinated vocational and non-vocational instruction in communications and mathematics to low-achieving students enrolled in vocational courses.
8. Provide vocational teachers with staff development in the basic competencies and instructional methods for teaching and reinforcing basic competencies.
9. Provide English, mathematics, and science teachers with staff development on applied instructional methods.
10. Provide students with access to a planned and coordinated program of academic and vocational studies to prepare them for employment and for continued learning.

Implementation of these practices, according to Governor Scott, would make three specific contributions to the students and schools of the region:

- Improve the educational prospects of non-college bound students since more than half the high school-age students in this region will not attend college.
- Broaden the base of college-bound students since increasing numbers of vocational completers find it necessary to continue their education beyond high school.
- Re-establish the partnership between vocational and academic education because the isolation and fragmentation of vocational education is no longer appropriate or practical.

Governor Scott asserted that every high school student should graduate with a foundation of basic academic competencies and useful skills for employment. Accomplishing this will require vocational and academic faculty to share in the responsibility, conceptualization, and support of these two common aims. He called for bridges to be built to reforge the partnership.

Instructional Principles for Increased Learning

Organizers of the Consortium recognize that without the ability to apply communications, mathematics, and science concepts to an occupational field, students will become "dead-end" workers. Members of the Consortium believe that if students are properly motivated and educated, they can succeed at higher levels.

Tom Sticht, President of Applied Behavioral and Cognitive Science, Inc. of San Diego, reminded participants that basic skills such as reading, writing, mathematics, scientific and technical knowledge, and problem-solving are interrelated capabilities that draw upon an individual's common knowledge base. Improvement in basic competencies strengthens students' ability to integrate these skills as they work to solve problems related to their vocational field of study.

Mr. Sticht encouraged teachers to find ways to teach communications skills and higher-level mathematics and science skills through a more applied process. According to Mr. Sticht, the following instructional principles facilitate learning and help students transfer knowledge into real-life settings thereby enabling them to work and learn effectively on the job or in a postsecondary institution.

- Let students know *what* they are expected to learn and *why* so that they understand the purpose of their program of study.
- Teach new academic and technical concepts and skills by constructing new lessons on the basis of old ones so that new learning builds on prior knowledge.
- Connect instruction in basic competencies (reading, writing, mathematics, and science) to students' vocational studies so that essential academic concepts are thoroughly learned and retained for use in other settings.
- Use the contexts, tasks, materials, and procedures of real-life work settings as the vehicles for teaching higher-level communications, mathematics, and science concepts.

Conditions Forcing Change in the Educational System

Robert Stoltz, Vice President and Director of the Office of Educational Policies at SREB, presented information concerning the changing demographics of the work force and requirements of the workplace. Recognizing that most changes in American education occur as a result of a real or an imagined crisis, Dr. Stoltz noted that the current push for changes in education is the result of concern about the economy, increased internationalization (the application of international standards for judging our educational and economic systems), aging of the population, and the quality of life.

It is anticipated that by the year 2000 the population in this country will grow by about 12 percent. Most new entrants into the work force during this period will be from minority groups, or will be females or immigrants. Dr. Stoltz noted that by 2050, the number of people over 65 will increase by 83 percent and young workers between 25 and 34 years of age will drop by 30 percent, leading to an increasingly middle-aged work force.

Dr. Stoltz said that projections indicate a decline in manufacturing jobs and an increase of jobs in service industries and that most jobs will require education and training beyond high school. The current dropout rate of about 25 percent is a serious drain on the economy. Although more people read and write now than ever before, many do not read and write well enough to meet society's current demands.

Dr. Stoltz emphasized that clear goals, similar to those proposed by the Consortium, will make it possible to improve student performance and help students reach the new standards expected in our society.

Changing School Experiences to Improve Achievement in the Basic Competencies

Sandra Pritz, Senior Program Associate at The National Center for Research in Vocational Education at The Ohio State University, noted that when developing the strategies and goals, organizers of the Consortium referred to certain facts about the secondary education experiences of students who pursue vocational studies. Typically, students completing a vocational program:

- Have average reading and mathematics achievement scores below students in the general and academic tracks, however, the difference in achievement occurs prior to enrollment in vocational education courses and the gap does not increase as a result of taking vocational courses.
- Take on average only three fewer academic courses than do other high school students, however, the academic courses they take are likely to be in the general curriculum—not in the college preparatory curriculum—and provide no in-depth study of any subjects.
- Spend 60 percent of their time using basic skills—reading, speaking, listening, writing, and mathematics, however, vocational teachers on average spend only about 3 percent of their time explicitly teaching these basic competencies.
- Are not required to complete the higher-level mathematics and science courses most related to their vocational studies.
- Are not assisted by either school counselors or teachers to plan a coherent and challenging program of vocational and academic studies designed to prepare them for employment and further learning.
- Express views that the school allows them to expect too little from themselves; they wish the school had encouraged them more.
- Can master higher-level academic concepts if the instructional process places more emphasis on practical and concrete learning experiences.

Pritz stressed to Conference participants that these facts about secondary vocational completers must change if schools are to significantly raise the basic competencies of vocational students.

Leadership is Key to Success

Ruth Steele, State Superintendent of the Arkansas Department of Education, discussed three requirements needed to achieve the Consortium's objectives: commitment from both state and local school superintendents; involvement of both vocational and academic teachers in the planning and implementation of staff development activities; and a cooperative learning spirit between teachers from the vocational and academic fields and respect for the talent and skills each possesses.

The most effective way to evaluate the program, according to Dr. Steele, would be to answer the basic question, "Has student learning improved?"

A Better-Educated Work Force is Needed

Dan Cameron, Superintendent of Quality Assurance—Statistics, Saginaw Division, General Motors, Athens, Alabama, discussed the levels of basic competencies needed in the modern workplace by underscoring the changing demographics and requirements of the workplace, and discussing the Japanese methods of training in which employees receive three or four times the training of American workers. Mr. Cameron pointed out the increased growth of the foreign market and concern about quality and cost, and noted that industry is promoting the cooperation of management and labor in team decision-making efforts with the goal of producing a better product.

Mr. Cameron stated that industry is spending millions to re-educate the work force to meet current and future needs. "To remain competitive, our region must have a better-educated work force. It is critical, therefore, that the Consortium promote and achieve its goal of raising the basic competencies of secondary vocational education completers."

Chapter 1

Raising Expectations for Students Pursuing Vocational Studies

The goals and strategies of the Consortium are based largely on three premises regarding expectations for secondary vocational completers: Neither vocational nor academic teachers hold high enough expectations for students enrolled in vocational programs; students tend to achieve at higher levels if expectations are realistic and if students have strong support systems at school, at home, and in the community; and students will come to expect more of themselves only when others have higher expectations of them.

It is widely believed that raising expectations is the first step toward improving the preparation of vocational students for employment and continued learning on the job or at a postsecondary institution.

Changing Local Policies to Reflect Higher Expectations

One objective of the Conference was to assist teams of administrators and teachers from each of the Consortium pilot sites to examine ways they might raise the achievement levels expected of vocational students. For the past two-and-a-half years, public schools in Gwinnett County, Georgia, have studied the process of building a local consensus for improving secondary vocational education. Alvin Wilbanks, Gwinnett County's Assistant Superintendent for Vocational Education, and Bill Heron, Director of High Schools in Gwinnett County, described this study to the Conference participants.

First, parents, educators, the business community, and civic leaders were involved in building local support for improving vocational education. A task force was then appointed to:

- Define the purpose, expectations, instruction, and achievements of vocational completers;
- Review the current status of the county's vocational education program;
- Determine needs of the program;
- Design an ideal program of vocational education;
- Identify Board policies, practices, and changes needed to implement the designed ideal program.

The Gwinnett County Board of Education is devoting a considerable amount of time to redesign and refocus vocational education in the county's secondary schools. The

Board has accepted the task force's recommendation to design a more rigorous curriculum of vocational and academic studies, and is now in the process of defining more clearly the purpose, expectations, definitions, and accountability standards of vocational education in Gwinnett County. The following are among the specific proposals currently being reviewed by the Gwinnett County School Board.

- The primary purpose of secondary vocational education would be to prepare students for employment and for continued learning on the job or in postsecondary education.
- Students pursuing vocational studies would be required to complete specified vocational and academic courses.
- Vocational completers would be required to demonstrate academic competencies at levels needed for continued learning.
- The vocational curriculum would be revised to place greater emphasis on the academic competencies that underlie the various occupational areas and on utilizing applied learning techniques in higher-level academic courses for vocational students.
- High school graduates who meet the higher expectations established for vocational completers would receive special recognition.

Institutionalizing Higher Expectations in the Schools

George Copa, Chairman of the Teacher Education Program at the University of Minnesota, noted that the Gwinnett County approach represents an ideal prototype for using local school board policies to place in the schools an improved program of vocational and academic studies. To assist other high schools to institutionalize changes in vocational and academic practices, Dr. Copa suggested that those involved with the Gwinnett County study visit other pilot sites to discuss with superintendents and school boards their successful process for building a community and school consensus for action. Dr. Copa felt the Gwinnett County team could provide a positive role model for personnel in other school districts, and added that this is an opportunity for local school boards to re-examine the secondary school curriculum to ensure that it is sufficiently rigorous and responsive to the needs of all students.

Using A "Tech-Prep" Strategy for Raising Expectations

M. Douglas James, Superintendent of Schools in Richmond County, North Carolina, outlined the three-year-old Tech-Prep program, which has raised student expectations in Richmond County. This program, which involved 18 months for planning and another 18 months for implementation, was designed to coordinate four years of study at the high school with two additional years of study at the local community college and has fostered a productive working relationship between the school system and the community college.

Dr. James noted that the biggest challenge in the Tech-Prep program was convincing parents and students that more and better skills are needed to enter and succeed in the workplace.

Dr. James outlined the seven components of the Tech-Prep program:

1. Courses of study were developed in three fields—engineering, business/entrepreneurship, and health/human services—to reflect emerging technological and job market trends in Richmond County.
2. Academic course requirements were specified in English, mathematics, science, and social sciences.
3. New vocational courses were added to the curriculum, including industrial technology, living technology, principles of technology, and entrepreneurship. Other courses were upgraded, for example, adding more advanced technology in electronics; adding computerized drafting to graphics, metals, and manufacturing; and adding word processing and data processing to business courses.
4. Provisions were made for staff orientation on Tech-Prep programs and specific staff training for new and upgraded courses.
5. Programs and courses were articulated with Richmond Community College to assure a well-developed four-plus-two program that closes curriculum gaps, eliminates unnecessary course overlapping, and provides for a smooth transition from high school to the community college.
6. A comprehensive career guidance program was developed at both junior and senior high school levels involving:
   - Computerized career guidance centers in each school;
   - A requirement that each ninth-grade student choose a course of study (Pre-college, Tech-Prep [engineering, health/human services, or business], or General Academic/Vocational) with parental approval prior to registering for the tenth grade;
   - Intensive student orientation and awareness programs prior to pre-registration, guidance and assistance during pre-registration, and follow-up to ensure enrollment in proper courses.
7. A comprehensive public information program was developed involving close cooperation among the school, college, and business and industrial communities.

Perhaps the biggest advantage of the Richmond County program is its flexibility. Students who have the ability to pursue higher-level courses are encouraged to do so. As a result, enrollment of high school juniors in algebra and advanced mathematics has increased from 58 percent in 1986-87 to 76 percent in 1987-88; in regular and pre-college English, enrollment is up from 62 to 70 percent over the same period.

About 25 percent of the 1988-89 sophomore class is enrolled in the Tech-Prep program. Vocational teachers feel better about the programs and they have become a strong partner with Richmond Community College in advancing the economic development of their community by improving the preparation of future workers.

Developing a Public Information Program Directed Toward Raising Expectations

One local school superintendent succinctly defined the problem of raising expectations for vocational students: "In order to raise expectations for students taking vocational education courses, it will be necessary to change existing attitudes of teachers, parents, and the community, who often share the belief that vocational education is the place for students who can't make it in general education."

North Carolina is developing a public information program targeted at changing such attitudes. Wayne Pennington, Chairman of Pennington Associates, Inc. in Raleigh and one of the developers of the North Carolina program, offered suggestions for dealing with the media, including planning media strategies to help parents and the community understand what educators are doing to combine and improve vocational and academic studies and providing the media with accurate, meaningful, and positive background information.

Mr. Pennington stressed that the focus of the message should be that the educational requirements for getting a good job have risen and will continue to rise, and vocational and academic courses must be upgraded. Pilot site leaders should emphasize that vocational and academic courses are being redesigned so that vocational completers will possess the higher levels of skills in the basic competencies needed to advance in employment or to pursue postsecondary study. According to Mr. Pennington, "You change the image of vocational education by developing strategies that require vocational students to achieve higher levels of reading, mathematics, and science competencies, and by informing the public of the action being taken."

Using Results from the National Assessment of Educational Progress to Develop Strategies for Raising Expectations

Thirty-three pilot sites in the SREB-State Vocational Education Consortium have student achievement results in reading, mathematics, and science based on the administration of the National Assessment of Educational Progress (NAEP) to 1988 vocational completers. These results will be used by pilot site personnel to develop and plan strategies for setting higher goals for future completers, and to assist students in achieving these higher expectations.

Douglas Rhodes, Associate Director of NAEP, suggested that each pilot site establish three study teams—one each in reading, mathematics, and science—composed of involved vocational and academic teachers, administrators, and counselors. Each team would:

- Determine the weaknesses in basic competencies of 1988 vocational completers which should be addressed in the preparation of future students;

- Develop a plan for vocational and academic instruction that will target the identified weaknesses in basic competencies;
- Propose a sequence of mathematics and science courses for vocational completers that would raise their basic competencies;
- Recommend revisions in vocational and academic curricula content and in instructional methods needed to improve basic competencies;
- Identify areas for staff and materials development that will be needed to implement their proposals.

Mr. Rhodes stressed that given adequate time and support, teams of vocational and academic teachers can gain the insight needed to set higher expectations for future vocational completers and to develop teaching strategies that will improve students' achievement in the basic competencies areas.

Chapter 2

Increasing the Percentage of Vocational Students Who Complete Higher-Level Academic Courses

For too long, vocational students have been allowed to sample courses "cafeteria style," with schools making little effort to direct them toward a coherent program of vocational and academic studies. Personnel at the Consortium pilot sites are expected in the future to devote more attention to the vocational and academic courses students take. One of the overall goals of the Consortium is to increase the percentage of vocational students who enroll in higher-level English, mathematics, and science courses. By providing students with a coherent, planned program of more rigorous vocational and academic studies, high schools will prepare graduates to be more capable workers and responsible citizens who possess greater ability to learn throughout their lives.

New Courses to Teach Higher-Level Academic Content

Acting on the belief that more technological changes will occur in the next 20 years than have occurred in the last century, three new courses have been developed to assist students in gaining the skills needed to advance and succeed in the workplace and in a postsecondary setting. Courses in applied communications, mathematics, and physics teach the content of academic courses found in the college preparatory curriculum through a more functional, real-world approach. Pilot sites are substituting these applied courses for the lower-level academic courses from the general curriculum frequently taken now by vocational students.

When creating these applied courses, the developers made sure that the higher-level academic content:

- Can be achieved by vocational students;
- Is practical and relevant;
- Emphasizes hands-on learning;
- Retains the integrity of essential content drawn from college preparatory courses;
- Uses teaching strategies designed to increase student motivation, comprehension, and application of knowledge and skills.

Bennie Lucroy, Director of Development at the Agency for Instructional Technology (AIT), described the applied communications package developed by AIT.

The package provides a practical curriculum for teaching students the reading, writing, listening, speaking, problem-solving, visual, and non-verbal skills demanded by today's workplace and is activity-oriented and designed to appeal to a variety of learning styles. Using this package, students do not just talk about communications, they learn and practice communications skills in conversations and meetings and through preparing memos, letters, reports, charts, and graphs.

The AIT package contains real-world, applied activities in five occupational areas—agriculture, business/marketing, health occupations, home economics, and technical/trade/industrial areas. The learning materials for each area are divided into 15 instructional modules, each with 10 lessons. The first seven lessons in each module provide instruction and practice in communication skills as they are generally used in the workplace. The last three lessons feature activities designed to develop and refine communications skills in the five major occupational areas mentioned above. Several pilot sites plan to implement the AIT package in revised English courses and to integrate appropriate lessons into existing vocational courses.

Leno Pedrotti, Vice President and Program Manager at the Center for Occupational Research and Development (CORD), explained that the curriculum for Applied Technical Mathematics, a course developed by CORD, is organized into 25 instructional units that can be used as the basis for a technical mathematics course. The first three preparatory units acquaint students with using a calculator and the different types of numerical systems. The 22 applied units include problem-solving techniques; measurement in English and metric units; using graphs, charts, and tables; using algebraic, geometric, and trigonometric principles to solve problems; working with two- and three-dimensional shapes; using ratios and proportions; working with scale drawings; concepts of precision, accuracy, and tolerance; and working with estimation, statistics, and probability.

The Applied Technical Mathematics curriculum focuses on real-world situations and problem-solving exercises that involve extensive use of the calculator. An emphasis is placed on "hands-on" experiential learning, with students working together to apply mathematics competencies in solving job-related problems.

Similarly, Dr. Pedrotti explained that Principles of Technology, an applied physics course, is designed to be both practical and academically rigorous for students planning to pursue technical careers. Principles of Technology was developed by a consortium of 45 state and Canadian provincial vocational education agencies in association with AIT and CORD. The course consists of a two-year sequence of 14 units of instruction, with each unit typically comprising 26 lessons of 50 minutes each (Table 1).

Each of the 14 units deals with one principle as it applies to the four energy systems—mechanical, fluid, thermal, and electrical—that make up both simple and complex technological devices and equipment. The units also cover the mathematics needed to understand and apply the principles.

Vocational and academic teachers received instruction during the Conference on ways to implement the AIT applied communications package, Applied Technical Mathematics, and Principals of Technology courses in the curricula.

TABLE 1

Principles of Technology Course Units

First-Year Units	Second-Year Units
Force	Momentum
Work	Waves and Vibrations
Rate	Energy Convertors
Resistance	Transducers
Energy	Radiation
Power	Optical Systems
Force Transformers	Time Constants

Increasing Enrollment in Higher-Level Academic Courses by Using a Program of Vocational and Academic Studies

Conference participants learned that a number of pilot sites are in the beginning stages of developing a program of vocational and academic studies for grades 9-12. One program that sites might consider as a model is the high-tech curriculum at Schenley High School, a magnet school in Pittsburgh, Pennsylvania. The curriculum is organized into two strands—the *professional* strand is designed for students who will enter an engineering program at a four-year college or university; the *technical* strand is designed for students seeking to enter the workplace or enroll in a postsecondary technical education program (Table 2). This curriculum was jointly developed by a committee of vocational and academic teachers, and representatives from high-tech industry in the Pittsburgh area.

In the ninth and tenth grades, both strands are almost identical. Thereafter, they diverge; the professional strand requires foreign language, calculus, and college preparatory physics; the technical strand requires further technical laboratory experiences.

Marion Scott, Director of Secondary Vocational Education in Gwinnett County, Georgia, reported on Gwinnett County's review of secondary education and efforts underway to define a program of academic and vocational studies to ensure that vocational completers are taught to learn, not just to work. Dr. Scott believes vocational and academic teachers must work closely together if vocational students are to learn the basic academic skills necessary to succeed on the job and have a reasonable chance of advancing beyond the entry level.

The Gwinnett County review found that:

- Basic skills and academic requirements in the workplace are rising, with the reading level of technical materials now ranging from the 10th to 13th or higher grade levels.
- Employers seek employees who understand technical language and concepts and can apply basic competencies in completing a job task.

TABLE 2

Course Sequence for High-Tech Program
Schenley High School
Pittsburgh, Pennsylvania

Professional Strand (University Bound)	Technical Strand (Work or Technical Training Bound)
Grade 9 (6 credits)	
1 English (composition/technical writing)	1 English (composition/technical writing)
1 Social Studies	1 Social Studies
1 Science (electricity/mechanics)	1 Science (electricity/mechanics)
1 Mathematics (algebra I)	1 Mathematics (algebra I)
1 Computer Literacy	1 Computer Literacy
1 Technical Lab (electricity)	1 Technical Lab (electricity)
Grade 10 (6½ credits)	
1 English	1 English
1 Science (pneumatics/hydraulics)	1 Science (pneumatics/hydraulics)
1 Mathematics (geometry)	1 Mathematics (geometry)
1 Technical Lab (electronics)	1 Technical Drawing
½ Technical Drawing	2 Technical Lab (electronics)
2 Elective*	½ Computers
*social studies, biology, art, music, foreign language, computer programming	
Grade 11 (6½ credits)	
1 English	1 English
1 Social Studies (U.S. history)	1 History (U.S. history)
1 Science (advanced pneumatics/hydraulics)	1 Science (advanced pneumatics/hydraulics)
1 Mathematics (trigonometry)	1 Mathematics (trigonometry)
1 Technical Lab (electronics)	2 Technical Lab (electronics/digital)
½ Computer-Assisted Design	½ Computer-Assisted Design
1 Elective*	
*chemistry, art, music, foreign language, computer programming	
Grade 12 (6½ credits)	
1 English	1 English
1 Social Studies (social issues)	1 Social Studies (social issues)
½ Industrial Mechanical/Simulation	½ Industrial Mechanical/Simulation
4 Elective*	2 Technical Lab
	2 Elective*
*calculus, foreign language, physics, art, music	*science, art, music, mathematics, vocational

- Students read less in school than is required of nearly every category of workers on the job.
- Until recently, academic skills have not been a priority among vocational teachers.
- Vocational and academic teachers have not worked together to improve the basic skills and academic achievement levels of vocational students.
- At least two-thirds of vocational students were enrolled in general academic courses in which instructional methods have not proven effective in raising their levels of basic academic skills.

Two programs of study have been proposed for Gwinnett County high school students pursuing vocational studies. One path would lead to a general diploma with a vocational concentration, the other to a college preparatory diploma with a vocational concentration. The core curriculum for both programs includes:

- 4 units in a single vocational concentration;
- 3 units of required applied academic courses or specified academic courses from the college preparatory curriculum;
- 2 units of related vocational courses to complement the student's major vocational concentration;
- ½ unit each in keyboarding skills and computer literacy.

In each program of study, students will be guided toward their diplomas by completing a sequence of vocational and academic courses that would best prepare them for their planned next step after high school. Students meeting the specified vocational and academic requirements of a high school vocational completer, regardless of which path is pursued, would receive a gold seal of endorsement on their high school diplomas in recognition of their added achievement.

Chapter 3

Emphasizing Increased Academic Content in Vocational Courses and Applied Learning Activities in Academic Courses

Vocational and Non-Vocational Teachers Share a Common Goal

Throughout the Conference emphasis was placed on the necessity of adjusting current curriculum content and methods of instruction to produce vocational completers who are skilled in rational thought and judgment, who have developed problem-solving and critical-thinking skills, and who are able to explain and defend their points of view.

A recent study conducted by The National Center for Research in Vocational Education at The Ohio State University found that in over 900 secondary vocational classrooms across the country, less than 3 percent of vocational instructors' time was spent explicitly teaching basic competencies. However, vocational students spend about 60 percent of their time using basic, often elementary, skills. The same study revealed that academic teachers do not spend a lot of time linking mathematics and science concepts to the functional context of a real-world work setting.

The thinking and problem-solving skills of high school students will develop more readily if they understand the connection between what they are learning and how it can be used. One way students can achieve this insight is if meaningful applied learning activities are integrated into communications, mathematics, and science courses and if essential concepts and skills from these courses are coordinated with instruction in vocational courses. Once students understand the application of academic knowledge, they are far more likely to recall and apply information than if they rely on rote memorization.

Improving Reading Achievement Through Vocational and Academic Courses

Margaret Purnell, Basic Skills Specialist at the Jonesboro Area Vo-Tech High School in Arkansas, and Rosie Lalik, Associate Professor in the College of Education at Virginia Polytechnic Institute and State University, led a Conference workshop on improving reading skills instruction for vocational students by using both the vocational and academic curricula. To emphasize the importance of reading, Ms. Purnell pointed out that employees in 98 percent of all occupations are required to read on the job for an average of 61 to 113 minutes each day.

According to Ms. Lalik, while procedural knowledge is important, critical knowledge is more important. She explained that before students are asked to read technical materials, teachers should determine the knowledge students already have about the subject. The class should examine what they know about the topic in general and specific terms. Then, students should be asked to read the new information and, with assistance from the teacher, compare the new information with their prior knowledge. Ms. Lalik stressed that this method will help students "construct their own system for organizing knowledge" and "take charge of their own learning."

In a model lesson presented by Ms. Lalik, participants were divided into groups of two and were asked to share with each other their feelings about applying for a loan. After discussing what was shared with the entire group, each participant read an article from *Time* magazine concerning a unique system of borrowing money. The partners then discussed the advantages and disadvantages of using this system. Following an open discussion, the entire group was split into groups of five and assigned the task of creating a form that would supply information for establishing a similar loan system. These forms were then put on transparencies and discussed.

The lesson demonstrated how to involve students in connecting old and new knowledge to complete assignments related to the workplace. Both Ms. Purnell and Ms. Lalik led the group in several other exercises that demonstrated model approaches to teaching reading.

Improving the Communications Skills of Vocational Completers

In Virginia, statewide efforts to strengthen basic skills in communications have been directed to all disciplines in the secondary program, with some special projects targeted toward vocational education. Called "Language Across the Curriculum," the project supports local district efforts to provide teachers in all subject areas with special training in instructional techniques that will help students use reading, writing, speaking, and listening skills as effective tools for learning.

The "Writing to Learn" extension of the "Language Across the Curriculum" project has recently produced a publication, entitled *Plain Talk,* in which teachers in all subject areas explain how using writing to learn has improved student understanding of the subjects and their ability to express their own ideas in writing. Another publication from the Virginia Department of Education, *Helping Students Learn: Group Discussion Concepts and Procedures,* provides guidance and suggestions for effectively using group discussion to stimulate critical thinking and problem-solving.

Ms. Lalik expressed the need to give students an opportunity to write and suggested that a journal is an ideal vehicle for developing their ability to write. Journal assignments could be based on technical readings or laboratory experiences from previous sessions, thus allowing students to express what they have learned in their vocational courses. Having students share their journal entries would demonstrate to students the value of sharing learned experiences.

Improving Achievement Through New Vocational Programs That Combine Rigorous Technical and Academic Studies

Many of the pilot sites are developing new kinds of vocational programs. One such innovative program, Diversified Technology, is a cooperative effort of the Bureau of Vocational-Technical Education of the Mississippi Department of Education and the Research and Curriculum Unit at the University of Mississippi. The goal of this effort is to provide an integrated and rigorous curriculum of academic and practical studies for students planning technical careers. Students are in the program for two hours each day during their last two years of high school and upon completing the program are prepared to enter employment or more advanced technical programs at any of Mississippi's junior colleges.

The curriculum of the Diversified Technology program addresses six content areas: technology and systems; electrical, mechanical, fluid, and thermal systems; and work and life skills. It consists of 40 instructional modules—students study 20 during the 11th grade and the remaining 20 during 12th grade. The second-year curriculum takes the student to a higher competency level than the first, while studying the same subject area, much like taking Algebra I and, later, Algebra II.

Upon completing the program, students should have an understanding of:

- The issues, dimensions, and uses of technology;
- The components of a technical system and how to solve problems within systems;
- How advanced technical equipment works and how to solve technical problems with it;
- The underlying principles at work in technical systems;
- Skills in leadership, management, quality, participation, inventory, communicating, and entrepreneurship.

Students selected to participate in the Diversified Technology program should:

- Be performing satisfactorily in their general education courses;
- Have completed one course in each of the following: algebra, physical or general science, and basic vocational education;
- Be interested in enrolling in a technical program at a junior college;
- Complete the Armed Services Vocational Aptitude Battery;
- Complete a one-on-one interview with a vocational education instructor/counselor.

Actions to Improve Mathematics Instruction

Radford Talley, Supervisor of Vocational Education at Cedartown Comprehensive High School in Polk County, Georgia, described results from interviews with students that were conducted throughout Polk County to gain an understanding of what

students recall about learning mathematics and to collect information on how mathematics instruction could be improved. Results of these student interviews revealed that the mathematics skills students most frequently remembered learning were basic skills (addition, subtraction, multiplication, and division), fractions, measurement, calculating area and volume, and geometric constructions. Measurement, fractions, and decimals were identified as the skills most important to students. They also reported applying mathematics skills through activities such as measuring floor plans or tracts of land and relating apples to addition, money to decimals, and pies to percentages.

When asked what types of activities in vocational education they remembered as requiring knowledge of mathematics, Mr. Talley indicated that students most frequently mentioned instruments they have to use, specific activities they are required to complete, and specific mathematics skills they must apply.

According to Mr. Talley, the most striking finding across all ability and grade levels was that the learning and retention of mathematics concepts and skills could be greatly enhanced if teachers would solicit and include examples from "everyday life," such as:

- Providing students with a mental image to better recall the way to apply a particular mathematics skill;
- Applying mathematics skills to something meaningful in their lives;
- Allowing students to use examples from their vocational classes and other experiences when attempting to utilize the mathematics skills they are learning.

The study in Polk County clearly revealed that students recall a real connection between the content of academic mathematics courses and the application of mathematics in vocational education.

Instructional Strategies for Developing Thinking Skills

Maggie Caples, Chief of Instructional Programs, and Barbara Kapinus, Specialist in Reading and Communication Skills, both from the Maryland Department of Education, suggested ways vocational and academic teachers can work together to enhance the thinking skills of vocational students, including:

- Remember "Wait Time I and Wait Time II"—provide at least three seconds of thinking time after a question and after a response.
- Utilize "think/pair/share"—allow individual thinking time, discussion with a partner, and class discussion.
- Ask follow-ups—Why? Do you agree? Can you elaborate? Can you give an example?
- Withhold judgment—respond to student answers in a non-evaluative fashion.

- Ask for a summary to promote active listening—"Could someone please summarize John's point?"
- Survey the class—"How many people agree with the author's point of view?"
- Allow for student calling—"Richard, would you please call on someone else to respond?"
- Play devil's advocate—require students to defend their reasoning against different points of view.
- Ask students to "unpack their thinking"—"Tell us how you arrived at your answer."
- Call on students randomly—avoid the pattern of calling on only those students who raise their hands.
- Encourage student questioning—let students develop their own questions.
- Cue student responses—"There is not a single correct answer for this question. I want you to consider alternatives."

Curriculum Revisions Are Planned

Conference participants learned that most Consortium pilot sites are planning to adjust their curriculum and methods of instruction to:

- Increase the time spent by vocational teachers on basic communications, mathematics, and science competencies;
- Revise the instructional strategies used by academic teachers to help students master, retain, and use communications, mathematics, and science skills;
- Develop new kinds of vocational programs designed to place greater emphasis on understanding and applying technical concepts in a broad vocational field of study.

Chapter 4

Advancing Basic Competencies Through Career Guidance and Remedial Studies

Using Test Results to Revise Curriculum and Course Selection

If future vocational education completers follow the same patterns in their selection of courses as 1988 completers, significant improvements in reading, mathematics, and science achievement are not likely to occur. However, if pilot sites identify skill areas where students scored low on the 1988 administration of the National Assessment of Educational Progress (NAEP) and make efforts to ensure that students take courses which address these weaknesses, improvements in students' basic skills may be expected. Information showing areas of weakness can be used to introduce additional units and encourage innovative instructional approaches in both the vocational and academic curricula.

To identify areas of weakness, Douglas Rhodes, Associate Director of NAEP, suggested a review of the NAEP data by pulling out items from the major subject matter categories to determine what percentage of students answered each question correctly. When 25 percent or more of the students responded incorrectly to questions in a given subject category, further analysis should be performed to determine the pattern of courses students had taken. Such an analysis would allow educators to improve their skills. For example, vocational students from sites where students take mostly general mathematics courses have lower mathematics scores than students from sites where students take one or more higher-level mathematics course. Unless students are effectively taught higher-level concepts, future mathematics scores will not differ significantly from those of past vocational completers.

Monitoring Student Progress

David Self, Superintendent of Schools in Mooreland, Oklahoma, described a computerized system that has been developed in Oklahoma to identify and track students' progress in communications, mathematics, and science competencies. Because students generally take courses at more than one site, the computer system has been centralized so that teachers can enter and retrieve student information from the system across all sites. Teachers then must monitor and review the progress made by students who exhibit weaknesses in any of the identified skills and give them further assistance.

Reaching Students Needing Extra Help

Conferees agreed that prior to enrollment in a specific occupational program, students should meet prerequisites in reading and mathematics. Pilot sites were encouraged to provide those students who fail to meet prerequisites with extra help, special instruction, and support services, such as:

- Developmental or remedial studies;
- An individualized vocational and academic plan of study and a system to monitor progress;
- Coordinated vocational and non-vocational instruction in communications, mathematics, and science.

Conferees also agreed that it is critical that minimum achievement levels in reading and mathematics be established for vocational students and that those minimum levels be higher than currently existing levels. Methods should be established to identify students needing extra help and innovative strategies should be devised to effectively provide the extra assistance needed to keep them in school.

Belinda McCharen, Vocational Guidance Coordinator for the Oklahoma Department of Vocational-Technical Education, pointed out that counselors can take a number of steps to improve the chances that potential school dropouts and underachievers will complete high school with higher levels of basic competencies. Enough is known about dropouts and underachievers for counselors to identify the students entering ninth grade who are at-risk of leaving school. Students who are most likely to drop out of school usually display the following characteristics:

- Two or more years behind grade level in achievement;
- Marginal or failing grades;
- "Turned off" by school and teachers;
- Low socio-economic background;
- Single-parent home;
- Little knowledge of labor market.

After identifying students at-risk of dropping out and students that need extra help to raise their basic skills, counselors and teachers can begin to implement actions that have been proven successful in keeping these students in school.

- Vocational courses help many students find a niche in school; thus, at-risk students should be encouraged to enroll in one or two units of pre-vocational courses in grades 9 and 10.
- At-risk students make significant gains in basic skills achievement when vocational and academic teachers coordinate instruction. Counselors should work with the principal to establish teams of vocational and academic teachers to coordinate instruction between the academic content areas and vocational education.

- Since most potential dropouts do not receive adequate support at home, counselors should encourage teachers to provide the extra support and attention these students need. In addition, peer tutoring programs are an excellent way to assist at-risk youth.
- Counselors should work with teachers to communicate to potential dropouts the realities of the workplace, the skills needed to function in today's society, and the relevancy of a high school education to success in the workplace.
- At-risk students need to see how vocational and academic courses work together to prepare them for a better job or postsecondary education upon completing high school. They need to know that the school believes they can make it and that they will be assisted in doing so.
- Counselors should ensure that potential dropouts are aware of the vocational programs that will provide them better opportunities for employment and higher earnings. Too often, at-risk students are enrolled in vocational courses with limited opportunities for employment, higher wages, advancement, and further education.

Most pilot sites plan to establish a formal process to identify potential dropouts and implement strategies to keep them involved in the learning process while improving their basic competencies.

Providing Remedial Instruction

Once potential dropouts have been identified, a plan must be in place for providing them with special instruction. Saundra Perry, Coordinator of Basic Education for the Bureau of Vocational, Technical, and Adult Education in the West Virginia Department of Education, described a program West Virginia has developed using computers to assist with remedial instruction. The software program, Basic Academic Skills for Employment (BASE), provides drills in basic language skills and mathematics pertinent to specific jobs. BASE software incorporates four management systems:

- The *counselor* helps the student select a specific job.
- The *manager* checks the student's progress and automatically selects lessons to address weaknesses.
- The *tutor* presents lessons, and scores quizzes and tests.
- The *reporter* produces progress and final reports.

During the spring of 1988, BASE was pilot-tested at two vocational centers in West Virginia involving a combination of 24 secondary students and 29 adult students. While positive results were recorded by all students at one site, further analysis of the data is needed to validate the program's effectiveness.

Improving Achievement Through Course Selection

Some pilot sites are using a "program of study" approach to close the gap between vocational and academic instruction and to prepare more students for both employment and postsecondary education. A typical program of study defines for high school students the sequence of vocational and academic courses required for either an occupationally-specific program, such as automotive mechanics or electronics, or a broad occupational field, such as business, human services, or technology.

One approach for helping students develop a high school program of study will be used in Georgia during the 1988-89 academic year. Phil Hulst, Career Guidance Consultant with the Georgia Department of Education, worked with an eighth-grade counselor and 15 eighth-grade students to develop "My Career and Educational Planning Folder."

The first part of the package consists of a leader's guide which instructs the counselor on providing nine 30- to 40-minute sessions with students during eighth grade. The second part, a set of activities designed to help students develop their plans, includes:

- Discovering Facts about Me
- Entering the World of Work
- Developing My Educational Plan for a Successful Career
- On the Road to Success: My Four-Year High School Plan
- Student Activity Worksheets

The program emphasizes that changes can be made at any time.

An optional program in Florida, "Teachers as Advisors Program," is trying to increase the amount of academic and career advisement available to students. General requirements for the program include:

- Specific attempts to meet the needs of disadvantaged and minority students;
- Maintaining a ratio of students to each teacher/advisor not exceeding 30 to 1;
- Ensuring that teachers/advisors contact the parent(s) or guardian(s) of students who are struggling academically and/or exhibiting other problems;
- Ensuring that teachers/advisors are faculty members who spend no less than 50 percent of their time as classroom teachers.

Coordinating Vocational and Academic Instruction

To provide successful career guidance and remedial studies, vocational and nonvocational teachers must understand the relevance of each others' content and coordinate their instruction across courses. Basic communications, mathematics, and science concepts must be explicitly reinforced to help students see how those concepts are used in the workplace.

Dee Wilder, Visiting Associate Professor in the College of Education at the University of South Florida, stressed that each teacher must be comfortable with his or her own curriculum and she focused on several key ingredients for integrating vocational and non-vocational instruction.

- Commitment to provide resources and reduce barriers;
- The instructional team should:
  - -involve all levels,
  - -describe the problem locally,
  - -have access to staff development;
- Opportunities to share concerns, questions, and successes;
- Explore options for delivering course content;
- Provide internal and external marketing of innovative methods of instruction;
- Demonstrate readiness to meet the challenge.

When vocational and academic educators share common goals for students and coordinate their instructional activities in pursuit of these goals, students learn more, and that, after all, is the bottom line. Educators should work together to ensure that procedures are in place to:

- Identify students having deficient skills and who possess the characteristics associated with potential dropouts;
- Develop instructional and support strategies that involve vocational and academic teachers;
- Provide an advisement process that will help students develop a meaningful four-year program of study.

Chapter 5

Staff Development for Vocational and Non-Vocational Teachers

At the pilot sites, few vocational teachers have had instruction on how to teach the academic foundations that underlie their occupational areas. Few have received instruction in teaching students how to read, comprehend, and use technical materials. In some areas, vocational teachers may need to concentrate on improving their own academic backgrounds in mathematics and science to be able to reinforce them as part of their vocational instruction.

Many academic teachers, while possessing a mastery of their subject matter field, have little or no experience in the workplace and, therefore, find it difficult to devise learning experiences to help students see the connection between communications, mathematics, and science skills and their application in the real world.

It is also important to help high school counselors and administrators rethink strategies that will raise the status of a combined vocational and academic program of study to one approaching the college preparatory program.

Using the Community for Staff Development

Lee Sloan, Director of the Cherokee Area Vocational Center in Gaffney, South Carolina, explained the Center's community-based approach to make educators aware of the increasing requirements potential employees face when seeking to enter the workplace. The Educators in Industry Program, which offers graduate credit through the University of South Carolina, allows educators to visit local industries to see firsthand the academic and technical knowledge and skills required for specific jobs. The program also includes presentations by local business and industry leaders, "shadowing" experiences where teachers spend a day at an industrial site, and visits to the Cherokee Area Vocational Center and Spartenburg Technical College. Based on these experiences, educators prepare presentations outlining their plans for improving basic skills instruction to students.

Mr. Sloan stated that the Educators in Industry Program provides teachers with realistic information about reading, writing, mathematics, science, and problem-solving skills that are used on the job. It also gives them the opportunity to develop activities which can be used in their classrooms to increase students' understanding of how basic skills are used in the work setting.

Implementing a Pilot Site Staff Development Program

Paula Heinke, Project Coordinator for the Randolph County School System in Elkins, West Virginia, explained that the Randolph County Teachers' Academy was designed to provide vocational and academic teachers an opportunity to work together to develop:

- An understanding of each other's curriculum content;
- A basic skills matrix for each of the different vocational curriculum areas;
- An annual plan to coordinate basic skills instruction between vocational courses and English, mathematics, and science courses;
- A collection of resource materials that demonstrate strategies to reinforce basic skills in both vocational and academic settings;
- Teaching techniques to help reinforce basic skills in vocational courses and to help connect academic instruction to students' vocational studies.

At the Academy, teachers work in inter-disciplinary teams and large group training is provided by specialists in reading, communications, mathematics, and science instruction and in curriculum development.

The Oklahoma Department of Education has launched a major staff development initiative to improve the academic foundation of vocational teachers and the applied instruction techniques of academic teachers. Lin Friedemann, Coordinator of Institutional Services at the Oklahoma Department of Vocational-Technical Education, outlined the types of activities this initiative has utilized:

- One-month workshop to prepare electronics teachers to teach Principles of Technology;
- One-week workshop to prepare mathematics teachers and provide orientation for vocational administrators who will implement technical mathematics courses;
- Four-day workshop, involving vocational and academic teachers in area vocational-technical schools and feeder high schools, to examine curricula and explore a format for redesigning English, mathematics, and science materials;
- One-day workshop for all vocational teachers on how to reinforce reading, writing, speaking, and listening through existing occupational courses;
- Regular planning sessions at pilot sites between vocational and academic teachers to determine ways teachers can cooperatively plan, instruct, and evaluate student progress on basic competencies achievement;
- Committees of vocational and academic teachers, administrators, and counselors to cooperatively promote and implement the applied academics courses.

Assisting Teachers to Translate New Knowledge into Classroom Practices

Most pilot sites are devoting a significant proportion of their extra resources to ongoing staff development programs for vocational and non-vocational teachers. Vocational teachers participating in the reading, mathematics, and science workshops at the Conference expressed a need for more content instruction in these areas and for more instruction on strategies for integrating the content into their occupational curriculum. Participating non-vocational teachers expressed the need for more help with instructional strategies that strengthen basic competencies achievement through applied instruction. Several local pilot site coordinators plan to provide their teachers with staff development that gives them an opportunity to practice their new skills with immediate feedback. While this approach to staff development is relatively costly, it is an effective way to help teachers implement new content and practices for advancing the basic competencies of vocational completers.

Chapter 6

Evaluation and Assessment Plan

Each of the pilot sites has agreed to participate in an evaluation and assessment of its program to see if the programs at the pilot site are adequately addressing the goals of the Consortium. Such an evaluation will measure the improvement of students' basic competencies, relate these to new strategies that have been implemented, and provide the basis for further improvements in the quality and types of instruction offered to students enrolled in vocational education.

In addition to the National Assessment of Educational Progress (NAEP), which is being used to assess student achievement in all sites, each state is encouraged to develop an evaluation plan for each of its pilot sites that includes the use of state-mandated tests currently administered to measure student achievement in the basic competencies.

Overview of the Assessment Plan

William L. Hull, Senior Research Specialist at The National Center for Research in Vocational Education at The Ohio State University, presented an overview of the Consortium's assessment plan. The goals of the plan are to determine if strategies have strengthened the basic competencies of vocational completers and if the curriculum and instruction in basic competencies in secondary schools have been improved. Dr. Hull emphasized that cooperation among vocational teachers and communications, mathematics, and science teachers is critical to achieving these goals.

The objectives of the assessment plan are as follows:

- Determine the extent to which instructional programs have improved the basic competencies of vocational completers.
- Determine how extensively the practices designed to raise the basic competencies of vocational completers have been implemented.
- Provide pilot site personnel with information that will help improve their efforts to raise levels of achievement in the basic competencies.
- Identify practices that have been implemented and report on those that appear to offer the greatest promise for improving basic competencies.

Dr. Hull mentioned that evidence of the following will indicate that the programs implemented at the pilot sites are successful.

- Actual improvement in basic competencies achievement in reading, mathematics, and science over a five-year period as measured by the National Assessment of Educational Progress.

- Significant improvement in basic competencies achievement when compared to a control site using state-developed pre- and post-assessment tests.
- A reduced or stable school dropout rate.
- Increased percentage of students enrolling in further education after graduation.
- Increased student and employer satisfaction with the levels of basic competencies students possess upon graduating.
- Improved rates of successfully placing graduates in employment related to their field of study.
- Increased or stable percentage of students who complete a concentration in a vocational program.
- Stable enrollment of special population students.

The following methods will be used to collect data for the evaluation and assessment plan:

- Data from NAEP and state-mandated standardized tests;
- Surveys of vocational completers;
- Transcript studies of vocational completers;
- Surveys of teachers and administrators;
- Follow-up surveys of completers and their employers.

Once collected, Mr. Hull explained how the data will be analyzed and reported.

- NAEP reports to sites and states with individual site, state, and Consortium data in numerical, verbal, and graphic form.
- Further analysis of the NAEP data tape, as appropriate.
- Regional report presenting baseline information from each site showing annual and trend data.

The evaluation schedule is as follows:

- Administration of NAEP — April and May 1988, 1990, and 1993
- Transcript analysis — August 1988 for 1988 graduates
  — August 1990 for 1990 graduates
  — August 1993 for 1993 graduates
- School personnel survey — annually
- Administrator's annual report — completed each summer
- Vocational completer and employer follow-up surveys — one year after graduation
- Site and state profile baseline information — spring 1989

Another effective way to determine the success of programs at the pilot sites, but a method that proved too costly for the Consortium, is to conduct classroom observations in a consistent manner across all pilot sites. Mr. Hull discussed the objectives, methodology, and outcome variables involved in classroom observations and suggested that individual pilot sites may want to pursue methods for evaluating the effectiveness of the programs and strategies being implemented.

Collection of Transcript and Personnel Information

Roy Thomas, Director of the Research Coordinating Unit at Marshall University in West Virginia, discussed the collection, evaluation, and use of student transcript data from the pilot sites. Comparing transcript data for 1988, 1990, and 1993 graduates should show changes in the amount and types of courses taken by vocational completers and will allow for comparisons with NAEP results collected from follow-up surveys.

Richard Baker, Head of the Department of Vocational and Adult Education at Auburn University in Alabama, discussed the importance of the Personnel Survey to the evaluation and assessment plan. By tracking the attitudes and perceptions of administrators and teachers, determining the effectiveness of programs can be further enhanced.

Assessment Should Guide Improvement

An effective evaluation of Consortium initiatives will assist pilot site leaders by providing comparable results across pilot sites. Practices that seem to offer the greatest promise for improving the basic competencies of vocational students will be identified and documented, allowing other sites to replicate them. In addition, an ongoing evaluation and assessment process should enable state and local pilot site leaders to take steps to improve instruction, assist students in selecting appropriate courses, and raise student expectations.

Summary

Linking Vocational and Academic Education

The over 350 educators from more than 30 school systems in 13 Southern states who participated in the Second Annual Staff Development Conference focused their attention on changes in practices that need to be made in their schools to significantly raise the communications, mathematics, and science achievement of vocational graduates.

Conference participants grappled with ways to forge new relationships between vocational and academic studies. All participants agreed that raising achievement in the basic competencies will require schools to establish higher expectations for students pursuing vocational studies. School officials from Gwinnett County, Georgia, and Richmond County, North Carolina, shared strategies they are pursuing to raise expectations, including requiring vocational students to complete prescribed vocational and academic courses that would prepare them for both employment and postsecondary education.

Most participants agreed that too many vocational completers have been allowed to meet their high school mathematics and science requirements by taking low-level general courses that are not related to their vocational studies and that add little to their achievement levels. Several participants shared ways to increase the number of vocational completers who take higher-level mathematics and science courses that are coherently related to their vocational studies. These ideas include:

- Implementing new types of mathematics and science courses specifically designed to teach higher-level content through an applied process;
- Re-examining and prescribing the sequence of mathematics and science courses required of those vocational completers who are not concurrently enrolled in the college preparatory program of study;
- Increasing the use of applied instructional strategies in academic courses to enable students to learn through a more functional real-world approach;
- Developing a prescribed program combining academic and vocational studies.

It was agreed that motivation, learning, and retention would be increased if students clearly understand and experience firsthand the connection between their vocational and academic studies. To increase the emphasis on academics in vocational courses and on work-related learning in academic courses, vocational and non-vocational teachers must recognize that they share a common goal—raising the communications, mathematics, and science competencies of vocational completers.

Closing the gap between vocational and academic instruction will require increased communication and joint staff and curriculum development activities between vocational and non-vocational teachers. The several initiatives presented for closing the gap between vocational and academic instruction include:

- Teaching reading and writing across the curriculum;
- Integrating related academic competencies into the vocational curriculum;
- Providing staff development for vocational teachers on teaching reading comprehension, technical writing, mathematics, and science through the vocational curriculum;
- Providing lead teachers in language arts, mathematics, and science with the extra time needed to revise their curricular and instructional strategies;
- Scheduling a series of joint planning meetings between vocational and non-vocational teachers.

Raising the basic competencies of vocational completers will require counselors to rethink the advice and assistance they give these students when planning a combined and rigorous program of vocational and academic studies. These students will need to make considered course choices in light of vocational education's dual purpose of preparing students for employment and postsecondary education.

Counselors participating in the Conference recognized three implications of the Consortium goals for them and their schools. First, counselors must pay more attention to students considering vocational studies when assisting them in the selection of more rigorous academic courses that are coherent with their vocational studies. Second, counselors must identify those students who need extra help if, by the time they graduate, they are to possess the levels of basic competencies needed for continued learning and employment. And third, school administrators must establish ways to provide the necessary assistance to those students who have been identified as needing extra help.

The Conference participants recognized that continuous evaluation of student learning and school practices will provide the basis for further efforts to improve vocational students' achievement in the basic competencies. The Consortium evaluation plan to assess the high school experiences and levels of basic competencies of vocational graduates in 1988, 1990, and 1993 was shared with Conference participants. Most participants expressed the belief that receiving continuous assessment results that would enable them to compare their strategies and results with other sites would provide them with incentives to make meaningful and effective changes.

With enthusiasm and confidence, the Conference participants began a five-year journey to improve the basic competencies of secondary vocational completers. Full realization of the Consortium dream will do much to improve future employment and educational opportunities for students who pursue a vocational program of study at the secondary level and will contribute to a more knowledgeable and flexible work force throughout the region.